

## DIVISION 8

### SECTION 3108F - FIRE PREVENTION, DETECTION, AND SUPPRESSION

**3108F.1 GENERAL.** This section provides minimum standards for fire prevention, detection, and suppression at MOTs. See Subsection 3101F.3 for definitions of “new” (N) and “existing” (E).

#### 3108F.2 Hazard Assessment and Risk Analysis

**3108F.2.1 Fire Hazard Assessment and Risk Analysis (N/E).** A fire hazard assessment and risk analysis shall be performed, considering the loss of commercial power, earthquake and other relevant events.

**3108F.2.2 Fire Plan (N/E).** A site-specific Fire Plan shall be prepared by a registered engineer or a competent fire protection professional. The plan shall consider the hazards and risks identified per subsection 3108F.2.1 and shall include, but not be limited to, the elements of pre-fire planning as discussed in Section 9 of [8.1] and Chapter 3 of [8.2]. The Fire Plan shall include goals, resources, organization, strategy and tactics, including the following:

1. MOT characteristics (e.g. tanker/manifold, product pipelines, etc.)
2. Product types and fire scenarios
3. Possible collateral fire damage to adjacent facilities
4. Fire-fighting capabilities, including availability of water (flow rates and pressure), foam type and associated shelf life, proportioning equipment, and vehicular access [8.1, 8.3]
5. The selection of appropriate extinguishing agents [8.1, 8.2]
6. Calculation of water and foam capacities, as applicable, consistent with area coverage requirements [8.1]
7. Coordination of emergency efforts
8. Emergency escape routes [8.2, 8.3]
9. Requirements for fire drills, training of wharf personnel, and the use of non-fixed equipment
10. Life safety

11. Rescue for terminal and vessel personnel [8.1]
12. Cooling water for pipelines and valves exposed to the heat
13. Contingency planning when supplemental fire support is not available. Mutual aid agreements can apply to water and land based support
14. Consideration of adverse conditions, such as electrical power failure, steam failure, fire pump failure, an earthquake or other damage to the fire water system.

The audit team shall review and field verify the fire-fighting equipment locations and condition and may check its operability.

**3108F.2.3 Cargo Liquid and Fire Hazard Classifications (N/E).** The cargo liquid hazard classes are defined in Table 31F-8-1, as either High ( $H_C$ ) or Low ( $L_C$ ), depending on the flash point.

Fire hazard classifications (Low, Medium or High) are defined in Table 31F-8-2, and are based on the cargo liquid hazard class and the sum of all stored and flowing volumes, prior to the Emergency Shut Down System (ESD) stopping the flow of oil.

The stored volume is the sum of the  $H_C$  and  $L_C$  liquid hazard class piping volumes ( $V_{SH}$  and  $V_{SL}$ ), if the piping is not stripped.

During a pipeline leak, a quantity of oil is assumed to spill at the maximum cargo flow rate until the ESD is fully effective. The ESD valve closure is required to be completed in 60 seconds if installed prior to November 1, 1980 or in 30 seconds if installed after that date (2 CCR 2380 (h) (3))[8.3]. The flowing volume is the sum of the  $H_C$  and  $L_C$  liquid hazard class volumes ( $V_{FH}$  and  $V_{FL}$ ), and shall be calculated as follows:

$$V_F = Q_C \times \Delta t \times (1/3,600) \quad (8-1)$$

Where:  $V_F$  = Flowing Volume ( $V_{FH}$  or  $V_{FL}$ ) [bbl]  
 $Q_C$  = Cargo Transfer Rate [bbl/hr]  
 $\Delta t$  = ESD time, 30 or 60 seconds

TABLE 31F-8-1 CARGO LIQUID HAZARD CLASS			
Class	Criterion	Reference	Examples
Low ( $L_C$ )	Flash Point $\geq 140^\circ F$	ISGOTT (Chapter 15, [8.4]) – Non-Volatile	#6 Heavy Fuel Oil, residuals, bunker
High ( $H_C$ )	Flash Point $< 140^\circ F$	ISGOTT (Chapter 15, [8.4]) – Volatile	Gasoline, JP4, crude oils

<p align="center"><b>TABLE 31F-8-2</b> <b>FIRE HAZARD CLASSIFICATIONS</b></p>						
Class	Stored Volume (bbl)			Flowing Volume (bbl)		Criteria (bbls)*
	Stripped	V <sub>SL</sub>	V <sub>SH</sub>	V <sub>FL</sub>	V <sub>FH</sub>	
LOW	y	n	n	y	y	$V_{FL} \geq V_{FH}$ , & $V_T \leq 1200$
LOW	n	y	n	y	n	$V_{SL} + V_{FL} \leq 1200$
MEDIUM	n	n	y	n	y	$V_{SH} + V_{FH} \leq 1200$
MEDIUM	y	n	N	y	y	$V_{FH} > V_{FL}$ , & $V_T \leq 1200$
MEDIUM	n	y	n	y	n	$V_{SL} + V_{FL} \leq 1200$
HIGH	n	n	y	n	y	$V_{SH} + V_{FH} > 1200$
HIGH	y	n	n	y	y	$V_T > 1200$
HIGH	n	y	y	y	y	$V_T > 1200$
HIGH	n	y	n	y	n	$V_{SL} + V_{FL} > 1200$
HIGH	n	n	y	n	y	$V_{SH} + V_{FH} > 1200$
HIGH	n	n	y	n	y	$V_{SH} + V_{FH} \leq 1200$
<p>y = yes n = no Stripped = product purged from pipeline following product transfer event. V<sub>SL</sub> = stored volume of low hazard class product V<sub>SH</sub> = stored volume of high hazard class product V<sub>FL</sub> = volume of low hazard class product flowing through transfer line during 30 - 60 secs. ESD. V<sub>FH</sub> = volume of high hazard class product flowing through transfer line during 30 - 60 secs. ESD. V<sub>T</sub> = V<sub>SL</sub> + V<sub>SH</sub> + V<sub>FL</sub> + V<sub>FH</sub> = Total Volume (stored and flowing) * Quantities are based on maximum flow rate, including simultaneous transfers.</p>						

### 3108F.3 Fire Prevention

#### 3108F.3.1 Ignition Source Control

**3108F.3.1.1** Protection from ignition by static electricity, lightning or stray currents shall be in accordance with API RP 2003 [8.5](N/E).

**3108F.3.1.2** Requirements to prevent electrical arcing shall be in conformity with 2 CCR 2341 [8.3] (N/E).

**3108F.3.1.3** Multi-berth terminal piers shall be constructed so as to provide a minimum of 100 ft between adjacent manifolds (N).

**3108F.3.2 Emergency Shutdown Systems.** An essential measure of fire prevention is communications in conjunction with the emergency shutdown. The ESD and isolation system shall conform to 2 CCR 2380 (h) [8.3] and 33 CFR 154.550 [8.6]. An ESD system shall include or provide:

1. An ESD valve, located near the dock manifold connection or loading arm (N/E).
2. ESD valves, with "Local" and "Remote" actuation capabilities (N).
3. Remote actuation stations strategically located, so that ESD valve(s) may be shut within required times (N).

4. Multiple actuation stations installed at strategic locations, so that one such station is located more than 100 feet from areas classified as Class I, Group D, Division 1 or 2 [8.7]. Actuation stations shall be wired in parallel to achieve redundancy and arranged so that fire damage to one station will not disable the ESD system (N).
5. Communications or control circuits to synchronize simultaneous closure of the Shore Isolation Valves (SIVs) with the shut down of loading pumps (N).
6. A manual reset to restore the ESD system to an operational state after each initiation (N).
7. An alarm to indicate failure of the primary power source (N).
8. A secondary (emergency) power source (N).
9. Periodic testing of the system (N).
10. Fire proofing of motors and control-cables that are installed in areas classified as Class I, Group D, Division 1 or 2 [8.7]. Fire proofing shall, at a minimum, comply with the recommendations of API Publication 2218 (see Section 6 of [8.8]) (N).

**3108F.3.3 Shore Isolation Valves (SIV).** Shore Isolation Valve(s) shall:

1. Be located onshore for each cargo pipeline. All SIVs shall be clustered together, for easy access (N).
2. Be clearly identified together with associated pipeline (N/E).
3. Have adequate lighting (N/E).
4. Be provided with communications or control circuits to synchronize simultaneous closure of the ESD system with the shut down of loading pumps (N).
5. Have a manual reset to restore the SIV system to an operational state after each shut down event (N).
6. Be provided with thermal expansion relief to accommodate expansion of the liquid when closed. Thermal relief piping shall be properly sized and routed around the SIV, into the downstream segment of the pipeline or into other containment (N/E).

SIVs installed in pipelines carrying hazard class,  $H_C$  liquids, or at a MOT with a risk classification "Medium" or "High" (see Table 31F-4-1), shall be equipped with "Local" and "Remote" actuation capabilities. Local control SIVs may be motorized and/or operated manually (N).

**3108F.4 Fire Detection.** An MOT shall have a permanently installed automated fire detection or sensing system (N).

**3108F.5 Fire Alarms.** Automatic and manual fire alarms shall be provided at strategic locations. The fire alarm system shall be arranged to provide a visual and audible alarm that can be readily discerned by all personnel at the MOT. Additionally, visual and audible alarms shall be displayed at the Facility's Control Center (N/E).

If the fire alarm system is integrated with the ESD system, the operation shall be coordinated with the closure of SIVs, block valves and pumps to avoid adverse hydraulic conditions (N/E).

**3108F.6 Fire Suppression.** Table 31F-8-3 gives the minimum provisions for fire-water flow rates and fire extinguishers. The table includes consideration of the fire hazard classification (Low, Medium or High), the cargo liquid hazard class (Low or High) and the vessel or barge size. The minimum provisions may have to be augmented for multi-berth terminals or those conducting simultaneous transfers, in accordance with the risks identified in the Fire Plan.

**3108F.6.1 Coverage (N/E).** The fire suppression system shall provide coverage for:

TABLE 31F-8-3 MINIMUM FIRE SUPPRESSION PROVISIONS (N/E)		
Fire Hazard Classification (From Table 31F-8-2)	Vessel and Cargo Liquid Hazard Class (From Table 31F-8-1)	MINIMUM PROVISIONS
LOW	Barge with $L_C$ (including drums)	<b>500 gpm of water</b> 2 x 20 lb. portable dry chemical and 2 x 110 lb. wheeled dry chemical extinguishers or the equivalent.
LOW	Barge with $H_C$ (including drums) Tankers < 50 KDWT, handling $L_C$ or $H_C$	<b>1,500 gpm of water</b> 2 x 20 lb. portable dry chemical and 2 x 165 lb. wheeled dry chemical extinguishers or the equivalent.
MEDIUM	Tankers < 50 KDWT handling $L_C$	<b>1,500 gpm of water</b> 2 x 20 lb. portable dry chemical and 2 x 165 lb. wheeled dry chemical extinguishers or the equivalent.
MEDIUM	Tankers < 50 KDWT, handling $H_C$	<b>2,000 gpm of water</b> 4 x 20 lb. portable dry chemical and 2 x 165 lb. wheeled dry chemical extinguishers or the equivalent.
HIGH	Tankers < 50 KDWT, handling $L_C$ or $H_C$	<b>3,000 gpm of water</b> 4 x 20 lb. portable dry chemical and 2 x 165 lb. wheeled dry chemical extinguishers or the equivalent. .
LOW, MEDIUM, HIGH	Tankers > 50 KDWT, handling $L_C$ or $H_C$	<b>3,000 gpm of water</b> 6 x 20 lb. portable dry chemical and 4 x 110 lb. wheeled dry chemical extinguishers or the equivalent.
<b>Notes:</b> $L_C$ and $H_C$ are defined in Table 31F-8-1. KDWT = Dead Weight Tons (Thousands)		

1. Marine structures including the pier/wharf and approach trestle
2. Terminal cargo manifold
3. Cargo transfer system including loading arms, hoses and hose racks
4. Vessel manifold
5. Sumps
6. Pipelines
7. Control Stations

**3108F.6.2 Fire Hydrants.** Hydrants shall be located not greater than 300 ft. apart, along the wharf and approach trestle [Section 4.2.3 of API 2001 [8.1]. Additional hose connections shall be provided at the base of fixed monitors and upstream of the water and foam isolation valves. Connections shall be accessible to fire trucks or mutual aid equipment as identified in the Fire Plan (N).

Hydrants and hoses shall be capable of applying two independent water streams covering the cargo manifold, transfer system, sumps and vessel manifold (N/E).

**3108F.6.3 Fire Water.** The source of fire water should be reliable and provide sufficient capacity as determined in the fire plan.

1. All wet systems shall be kept pressurized (jockey pump or other means) (N/E).
2. Wet system headers shall be equipped with a low-pressure alarm wired to the control room (N).
3. Fire pumps shall be installed at a distance of at least 100 ft. from the nearest cargo manifold area (N).
4. Hose connections for fireboats or tugboats shall be provided on the MOT fire water line. Connections shall be installed at a safe access distance from the high-risk areas such as sump, manifold and loading arms (N/E).

**3108F.6.4 Foam Supply (N/E).** Product flammability, foam type, water flow rates and application duration shall be considered in foam supply calculations.

Fixed foam proportioning equipment shall be located at a distance of at least 100 ft. from the high-risk areas such as sump, manifold and loading arms, except where hydraulic limits of the foam delivery system require closer proximity.

MOTs shall have a program to ensure that foam is replaced according to the manufacturer's recommendations.

**3108F.6.5 Fire Monitor Systems.** Fire monitors shall be located to provide coverage of MOT cargo manifolds, loading arms, hoses, and vessel manifold

areas. This coverage shall provide at least two independent streams of water/foam. Monitors shall be located to provide an unobstructed path between the monitor and the target area (N/E).

If the vessel manifold is more than 30 ft. above the wharf deck, the following factors shall be considered, in order to determine if monitors located on elevated masts or towers are required (N/E):

1. Maximum tanker freeboard
2. Tidal variations
3. Pier/wharf/loading platform elevation
4. Winds
5. Fire water line pressure

Sprinklers and/or remotely controlled water/foam monitors shall be installed to protect personnel, escape routes, shelter locations and the fire water system (N).

Isolation valves shall be installed in the fire water and the foam lines in order to segregate damaged sections without disabling the entire system. Readily accessible isolation valves shall be installed 100 – 150 ft from the manifold and the loading arm/hose area (N).

**3108F.6.6 Supplemental Fire Suppression Systems (E).** A supplemental system is an external waterborne or land-based source providing suppressant and equipment. Supplemental systems may not provide more than one-quarter of the total water requirements specified in the Fire Plan.

Additionally, supplementary systems shall not be considered in a Fire Plan, unless available within 20 minutes following the initiation of a fire alarm. Mutual aid may be considered as part of the supplemental system.

### **3108F.7 References.**

- [8.1] American Petroleum Institute, 1998, API Recommended Practice 2001 (API RP 2001), "Fire Protection in Refineries," 7<sup>th</sup> ed., Washington, D.C.
- [8.2] Oil Companies International Marine Forum (OCIMF), 1987, "Guide on Marine Terminal Fire Protection and Emergency Evacuation," 1<sup>st</sup> ed., Witherby, London.
- [8.3] 2 CCR 2300-2407 (Title 2, California Code of Regulations, Sections 2300-2407).
- [8.4] International Chamber of Shipping (ICS), Oil Companies International Marine Forum (OCIMF), International Association of Ports and Harbors (IAPH), 1996, "International Safety Guide for Oil Tankers and Terminals (ISGOTT)," 4<sup>th</sup> ed., Witherby, London.

- [8.5] *American Petroleum Institute, 1998, API Recommended Practice 2003 (API RP 2003), "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents," 6<sup>th</sup> ed., Washington, D.C.*
- [8.6] *33 CFR 154.550 (Title 33, Code of Federal Regulations, Section 154.550).*
- [8.7] *National Fire Protection Association, 2002, NFPA 70, "National Electric Code," Quincy, MA.*
- [8.8] *American Petroleum Institute, 1999, API Publication 2218, "Fireproofing Practices in Petroleum and Petrochemical Processing Plants," 2<sup>nd</sup> ed., Washington, D.C.*

Authority:       Sections 8755 and 8757, Public Resources Code.

Reference:       Sections 8750, 8751, 8755 and 8757, Public Resources Code.